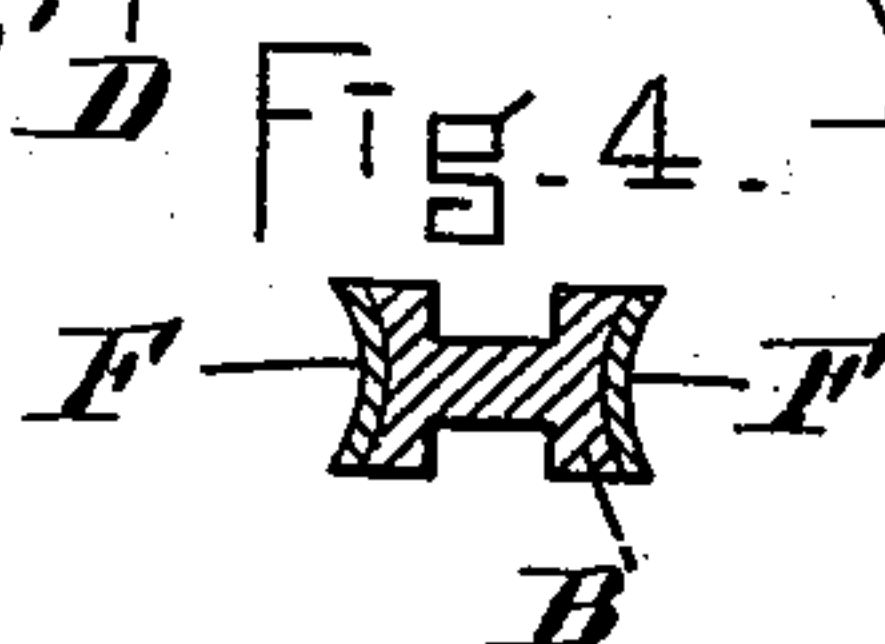
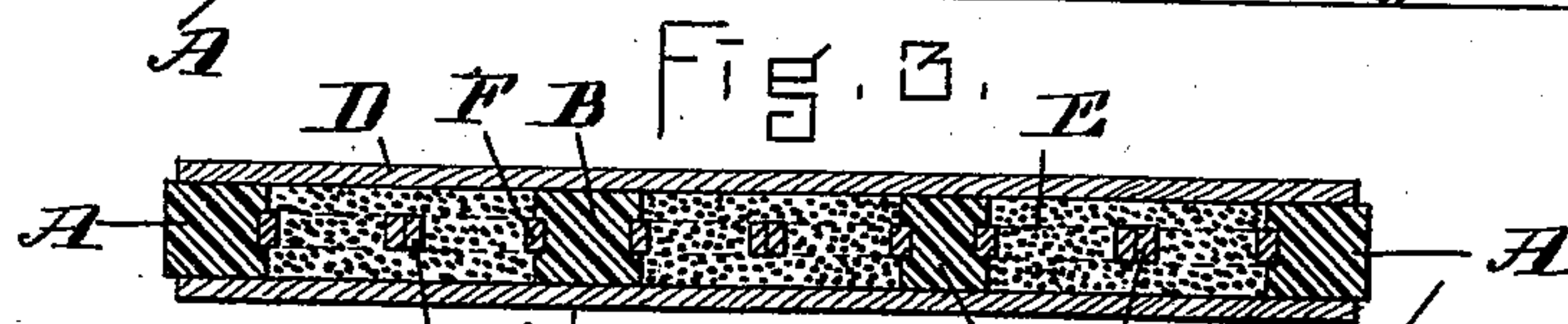
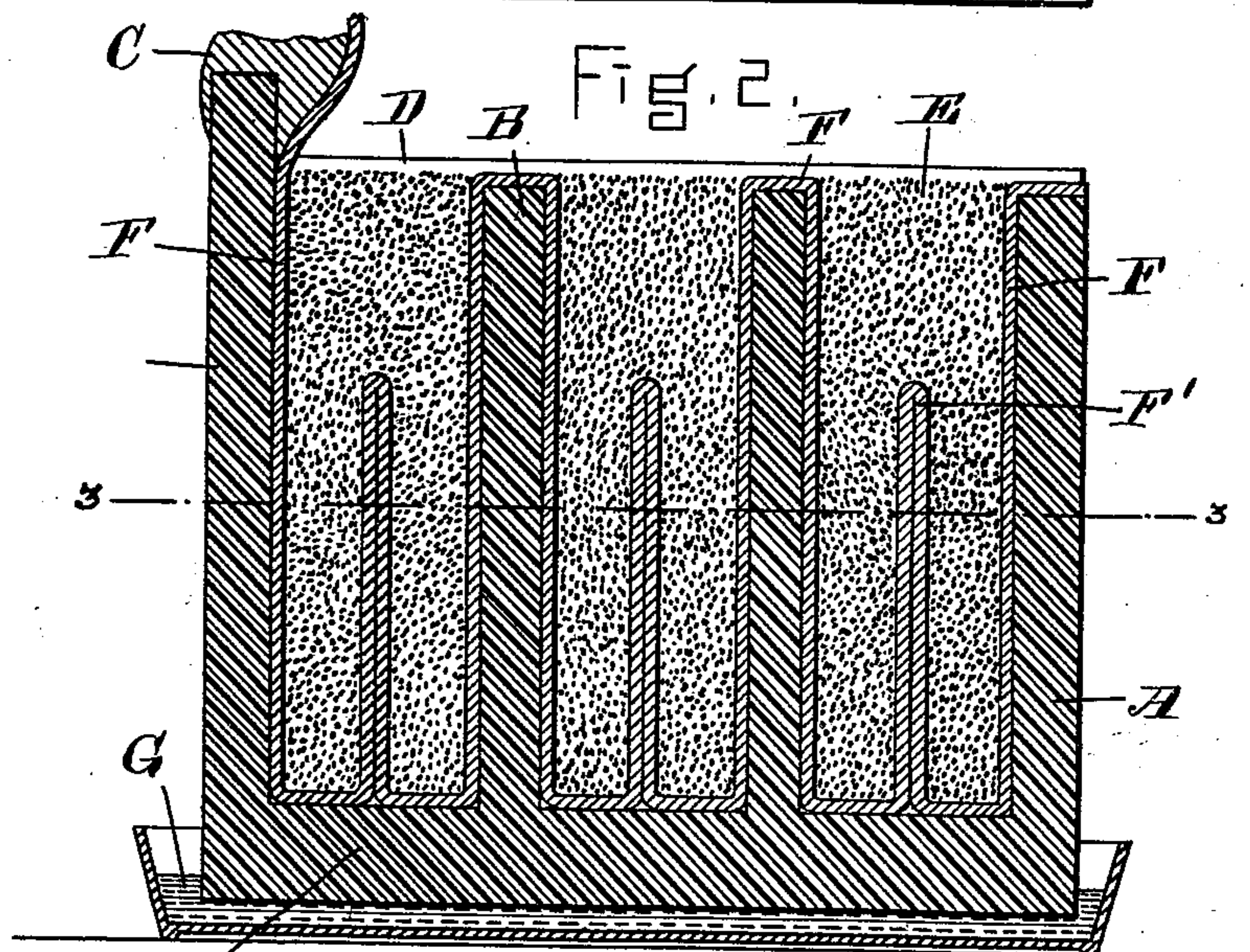
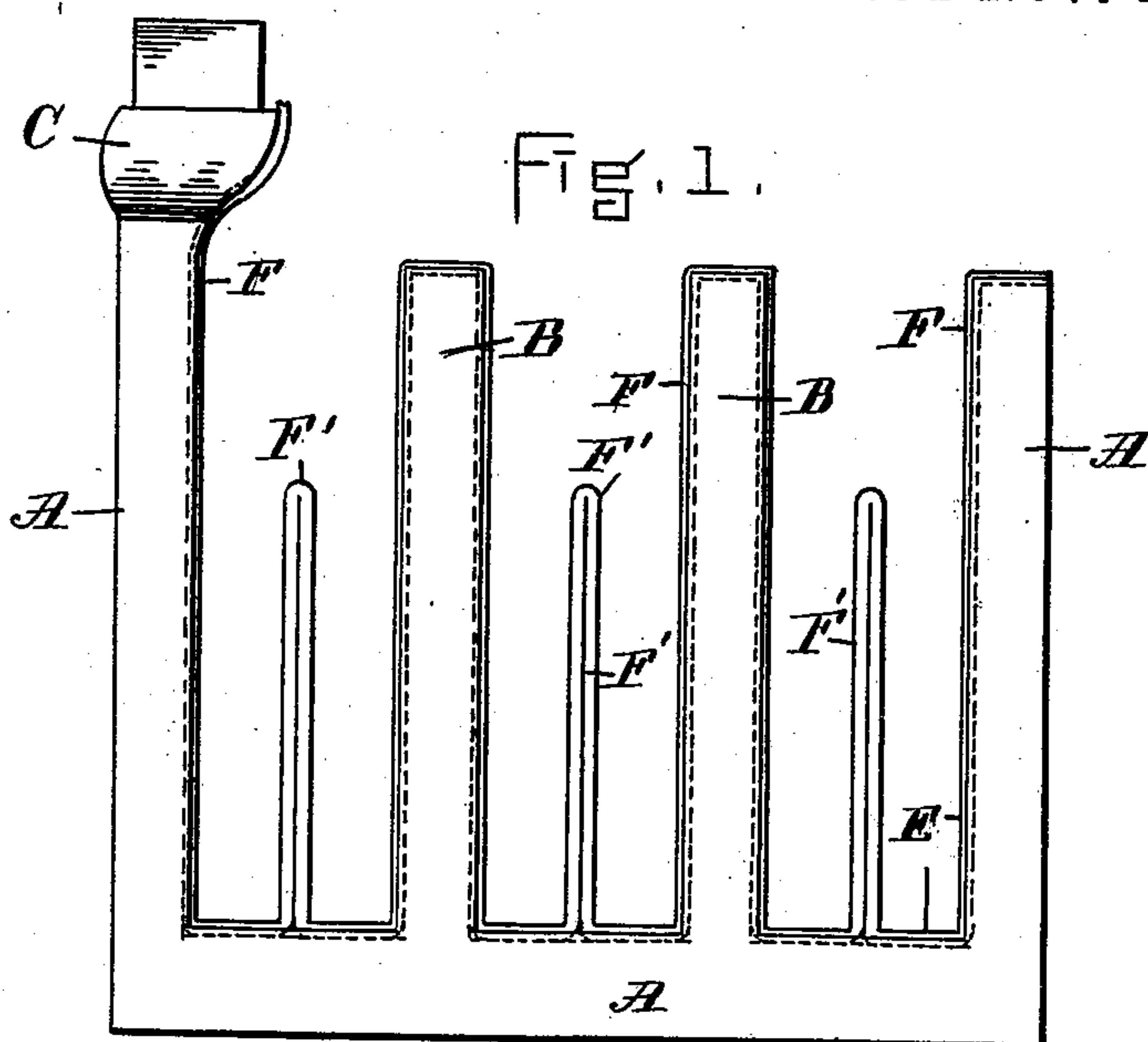


(No Model.)

E. P. USHER.
STORAGE BATTERY.

No. 509,267.

Patented Nov. 21, 1893.



WITNESSES,
R. Henry Marsh.
L. F. Bridge.

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UNITED STATES PATENT OFFICE.

EDWARD P. USHER, OF GRAFTON, MASSACHUSETTS, ASSIGNOR TO THE HOPE-DALE ELECTRIC COMPANY OF WEST VIRGINIA, OF WEST VIRGINIA.

STORAGE-BATTERY.

SPECIFICATION forming part of Letters Patent No. 509,267, dated November 21, 1893.

Application filed January 23, 1893. Serial No. 459,474. (No model.)

To all whom it may concern:

Be it known that I, EDWARD P. USHER, of Grafton, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Storage-Batteries, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to the accumulator plates of storage batteries, and especially to the conductors and frames of such plates. The plates of my battery are kept from lateral contact with each other by means of wooden separators or the like, and the elements, when properly arranged, are fixed in position by a quick-hardening gum. Owing to the great expense of aluminium at this time, I do not, for practical use, make the entire frame of that metal, although it is feasible to do so.

My invention consists in a frame or skeleton for battery plates having a conducting strip such as aluminium in contact with the active material, such frame being preferably made of vulcanized rubber or equivalent substance unaffected by the acid employed, and having upright bars preferably grooved or vertically recessed along their inner edges to receive and retain a narrow ribbon or wire of the aluminium or like conducting material. Such ribbon may, however, be pressed into close contact with the inner edge of said bars instead of entering a defined groove therein. In either case, the end of the wire or ribbon is united to the lug by which the plate is connected to others in the series. This union is preferably effected by means of a leaden lug surmounting the endmost bar of the frame. Tongues of the conducting wire or ribbon may be formed between the upright bars or arms of the frame and in the same plane. Thin sheets of wood forming separators are placed each side of each skeleton, and the material to become active is applied in the spaces of the frame inclosed by such separators, in the form of a dry powder, loose or in tablet form. The various combinations in which my invention is embodied are specified in the appended claims.

In the drawings, Figure 1 is a side elevation of one of the rubber frames or skeletons,

in suitable shape. Fig. 2 is a vertical central section through the complete plate, from edge to edge, showing the various parts in their proper relative position. Fig. 3 is a horizontal section on line 3—3 of Fig. 2. Fig. 4 is an enlarged transverse section of one of the uprights, recessed in its sides and showing the conducting ribbon in its concave edges.

A represents the skeleton of hard rubber or the like, made with such number of vertical bars B as is desired.

C is a metallic lug, surmounting the endmost portion of the frame and adapted to be firmly united to the transverse bar which connects the several plates of each series.

D D, Fig. 3, denote wooden separator sheets, placed in close contact with each side of the frame and bars, serving to inclose a body of active material E in powdered form, filled into the vertical spaces between such parts either loosely or in tablet form.

F indicates a ribbon or wire of aluminium or other suitable conducting material resting against and preferably partially embedded in the inner edges of the frame and upright bars, where it is in immediate contact with the active material E. Tongues or loops F' of this ribbon or wire are shown in the several figures, penetrating the body of active material. The end of the wire or ribbon is represented as connected to the metallic lug C, but it may extend directly to the transverse connecting bar which unites the series of plates. Instead of being sunken in a groove in the upright bars the metallic ribbon may be folded around a projecting edge of said parts.

The lower edges of the frames or plates and separators are embedded in a shallow bed of quick-hardening gum G, applied while hot, which when cold holds the parts firmly.

The superior conductivity, strength and lightness of aluminium, and its capacity to resist oxidation, justify its use in storage batteries in place of metallic lead, notwithstanding its present increased cost.

I claim as my invention—

1. In a battery plate the frame or skeleton described made of vulcanized rubber or the like, and having upright bars provided along their inner edges with a ribbon or wire of

aluminium as a conducting material, in combination with a filling of material to become active, supported by said frame and in contact with said wire or ribbon, and with continuous wooden separator sheets inclosing the sides of such plate, substantially as set forth.

2. In a battery plate, the frame or skeleton described having upright arms grooved along their inner edges, and a conducting ribbon or wire therein, formed with projecting tongues or loops in the plane of the plate, in combination with a filling of active material in a dry powdered form, and with non-conducting separators inclosing such material laterally, substantially as set forth.

3. In a storage battery plate, a skeleton or marginal frame of vulcanized rubber having upright arms or bars, one of which is sur-

mounted by a metallic lug by which such plate is connected in series with the others, in combination with a conducting ribbon or wire joined to said lug and arranged along the inner edges of such arms, and with a filling of active material placed in the spaces between such arms and inclosed laterally by wooden separators, such frames and separators being set in a base and embedded in a hardening gum, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 21st day of January, A. D. 1893.

EDWARD P. USHER.

Witnesses:

A. H. SPENCER,

THOMAS J. KENNY.